Lipids

Medical importance of lipids:

1-Acts as energy storage (1 gram of lipids = 9Kcal)

2-Cholesterol is responsible for production of hormones, Vitamin D and bile acids that digest and absorb lipids.

3-Provide insulation to body and protect organs from shock.

4-Integral part of the cell membrane

5-Important in absorption and digestion of fat soluble vitamins

Classification of lipids:

1-Simple lipids (Acylglycerol, Waxes)

2-Compound lipids (phospholipids, Glycolipids, lipoproteins)

3-Derived lipids (fatty acid, fat-soluble vitamins, steroids, ketone bodies)

1-Simple lipids:

A-Acylglycerol (triacylglycerol, diacylglycerol, monoacylglycerol)

-Function/importance:

1-The major storage form of energy

2-Poor conductor (prevents heat loss from body)

B-Waxes: (cholesterol ester, Vit A ester, earwax)

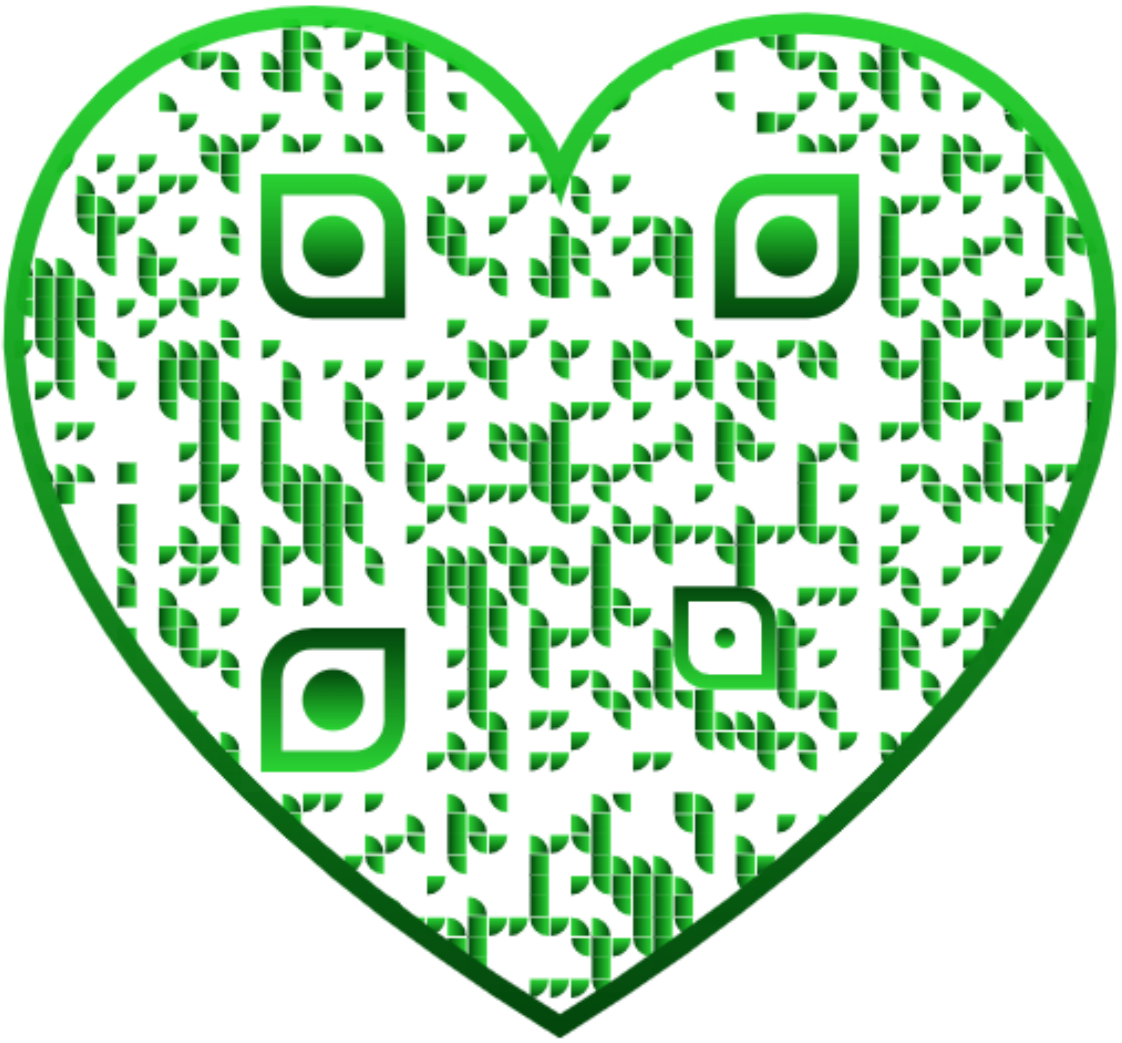
1-Protection from bacteria and fungi 2- Lubrication and cleaning of ear canal

2-Compound lipids:

A-Phospholipids:

Phospholipids can form:

1- Micelle: sphere structure of phospholipids and has a role in absorption and digestion of lipids in small intestine
2- Lipid bilayer: basic structure of biological membrane.
3- Liposome: has a role in pinocytosis and exocytosis. الكريمات الموجودة في الصيدليات مليئة به



Classification of phospholipids (2 groups):

A-Glycerphospholipids:

1- Phosphatidic acid: intermediate in the synthesis of phospholipids
2- Phosphatidylcholine: -Lecithin are major component of cell membrane –treatment of fatty liver and atherosclerosis – prevent lung collapse
3- Phosphatidylethanolamine: activating of factor 3 **thromboplastin**
4- Cardiolipin: -component of mitochondrial membrane which produce energy –diagnosis of syphilis
5- Phosphatidylserine: component of cell membrane
6- Phosphatidylinositol: -component of cell membrane -2nd messenger for hormones
7- Plasmalogen: platelet activating factor

Medical importance:

1- Respiratory distress syndrome.

2-Snake venom contains enzyme called **phospholipase** lead to hemolysis

B-Sphingomyelins: Help raid transmission of nerve impulses.

B-Glycolipids:

1- Cerebrosides (the simplest glycoprotein): has 2 types: a- glucocerebrosides b-galactocerebrosides
   - Importance: act as insulator of nerve impulse.
2- Gangliosides: receptor for hormones, toxen and viruses.
3- Sulfolipids: found in myelin
4- Ceramide oligosaccharides : constituent of blood groups

C-Lipoproteins (transport of lipids) وظيفة بشكل عام

1-Chylomicrons:

-Properties: 1-The largest lipoprotein 2-produced in the intestine 3-produce exogenous or dietary lipid from intestine into blood 4- Enriched in triglycerides

Apoprotein functions:

1-structural role 2-binding sites for receptors 3-activator for enzymes

2-Very low-density lipoprotein (VLDL):

-Properties: 1-Enriched in triglycerieds 2-produced in liver

3- Transport endogenous lipids from liver into blood

3-Low density lipoprotein (LDL):

-Properties: 1-Bad cholesterol 2-Transport cholesterol from liver into blood 3-Enriched in cholesterol 4-increase the risk of cardiovascular diseases 5-increase in male 6-produced from VLDL

4-High density lipoprotein (HDL):

-Properties: 1- good cholesterol 2-Smallest lipoprotein 3- increase in female 4- Enriched with cholesterol 5- produced in liver 6- Transport cholesterol from extra hepatic tissue into liver

7-reduce the risk factors of cardiovascular disease 8- source of apoprotein C, E

3-Derived lipids:

1-Fatty acids:

Essential fatty acids: are fatty acids, which cannot be synthesized in the body and must be obtained from the diet for good health.

Important of essential fatty acids:

1- Precursors of eicosanoids
2- Enter in cell and mitochondrial membrane
3- Cervonic acid (is synthesized from linolenic acid or taken from fish) is found in large amount brain, retina, sperm, and testes
4- Decrease blood cholesterol.

Properties of fatty acids:

1- The short chains are soluble in water and lone chains are insoluble.
2- The short chains are liquid at room temperature and long chains unsaturated fatty acids are liquid at room temperature but long chains saturated are solid at room temperature

-**Eicosanoids** :المركبات العشرينية

Formed from arachidonic acid, and classified into Prostaglandin, Thromboxanes, and Leukotriens.

-**Prostaglandin**: Local hormones.

Function: 1- Contraction and relaxation of smooth muscle 2- Dilation and constriction of blood vessels 3- Control of blood pressure 4- Modulation of inflammation

2-Steroids:

A-Cholesterol:

Functions of cholesterol:

1- Essential structural component of cell membrane.
2- Precursors of bile acids, fat soluble hormones, and vitamin D

-Bile acids: are synthesized from cholesterol in liver and stored in gall bladder.

-Importance: Help in the digestion and absorption of lipids

-Emulsification: is broken down of large lipid particles into small particles.

Bile acid are classified into:

1- Primary bile acids : Cholic acid, and Chenodeoxy cholic acid
2- Secondary bile acids: Deoxycholic acid, lithocholic acid
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